



CMS JetMet Meeting

HCAL
JET
MET

Missing Et status at low and high luminosity

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Content

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- **Generated rates (also for no pile-up)**
 - **All particles**
 - **Calorimeter scope**
- **L1 & L2.0 rates**
- **L2.2 rates @ low lumi only**
- **Rates @ 95% efficiencient cuts**
- **95% efficient cuts**



Event Statistics

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Pthat (GeV)	Low lumi	High lumi
0–15	94802	95376
15–20	150000	148600
20–30	148500	151000
30–50	133304	145610
50–80	146141	149250
80–120	133500	100000
120–170	147500	149500
170–230	42000	45000
230–300	20000	20000
300–380	4500	14000
380–470	10750	12250
470–600	5100	9000



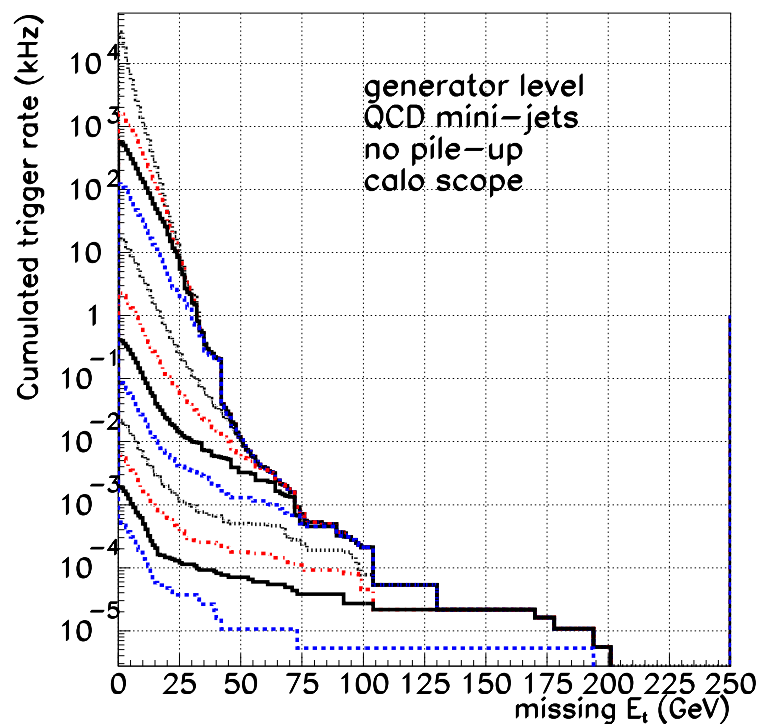
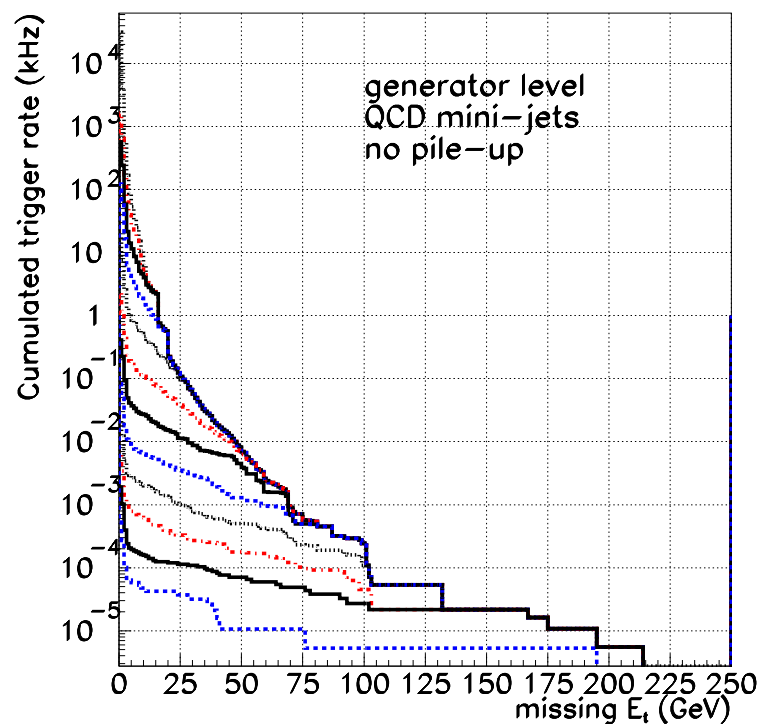
No pile-up generated rates

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1 Hz threshold – all ~ 75 GeV, calo scope ~ 75 GeV

LEFT : all particles

RIGHT : calorimeter scope ($|\eta| < 5$)





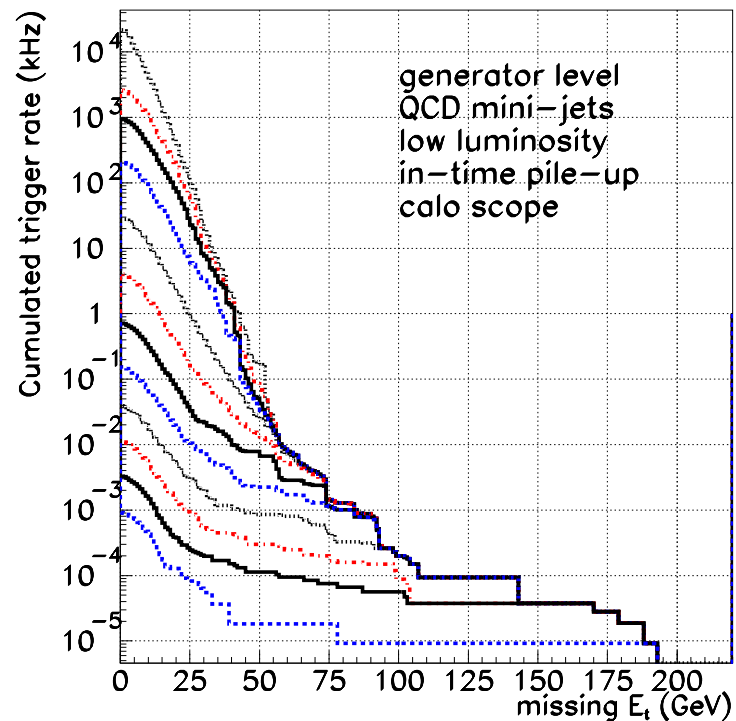
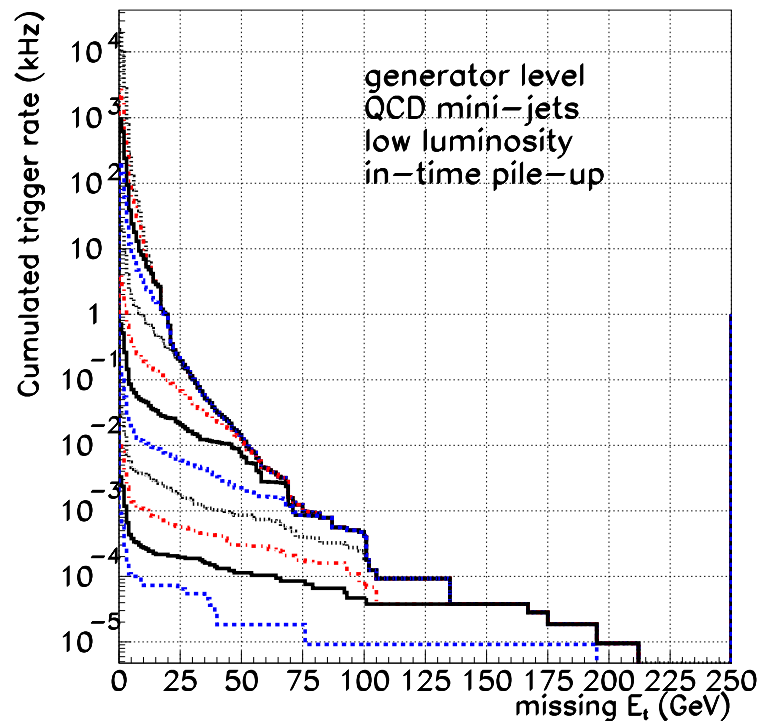
Low lumi generated rates

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1 Hz threshold – L1 ~ 85 GeV, L2 ~ 90 GeV

LEFT : all particles RIGHT : calorimeter scope ($|\eta| < 5.$)

p_{that} > 120 GeV needs more statistics





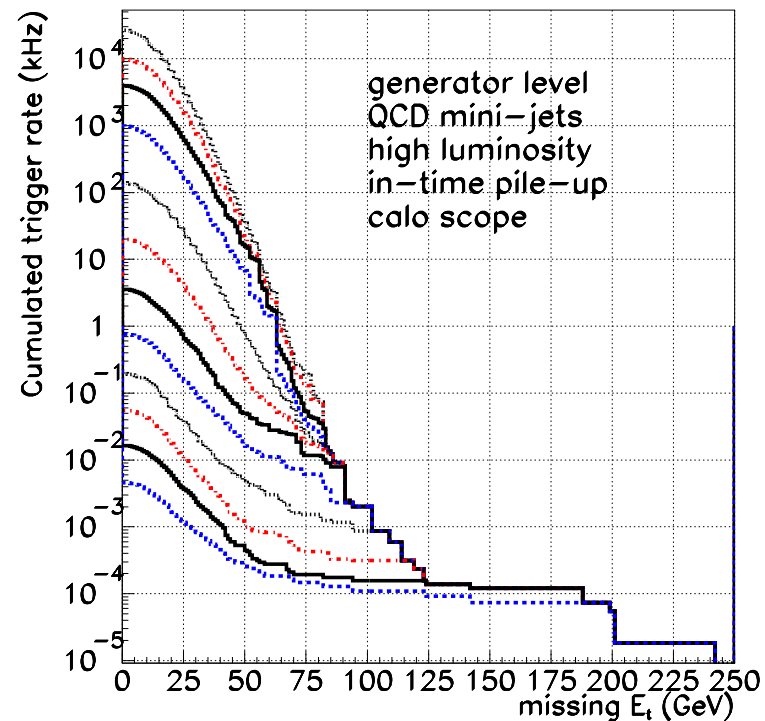
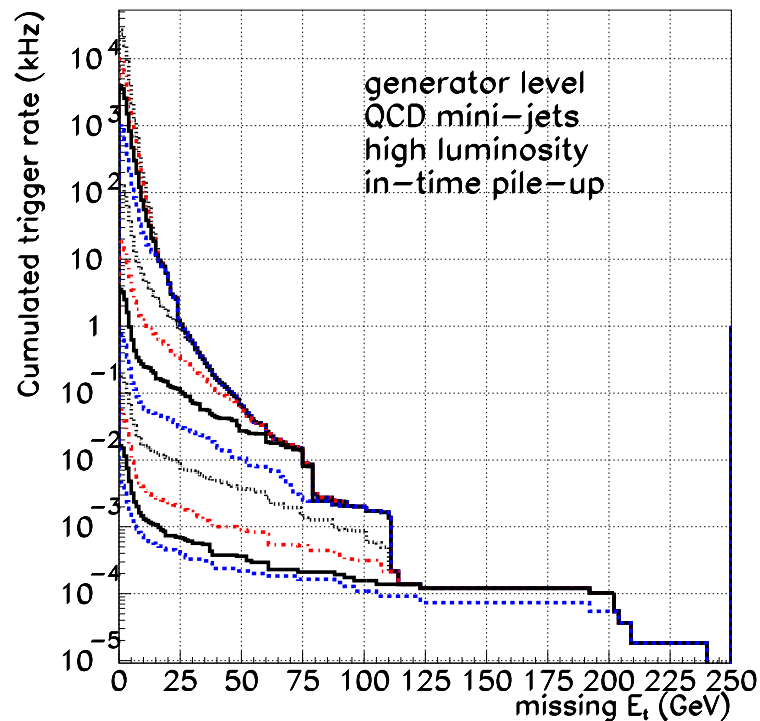
High lumi generated rates

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1 Hz threshold – all ~ 175 GeV, calo scope ~ 170 GeV

LEFT : all particles RIGHT : calorimeter scope ($|\eta| < 5$.)

$p_{\text{t}} > 120$ needs more stats





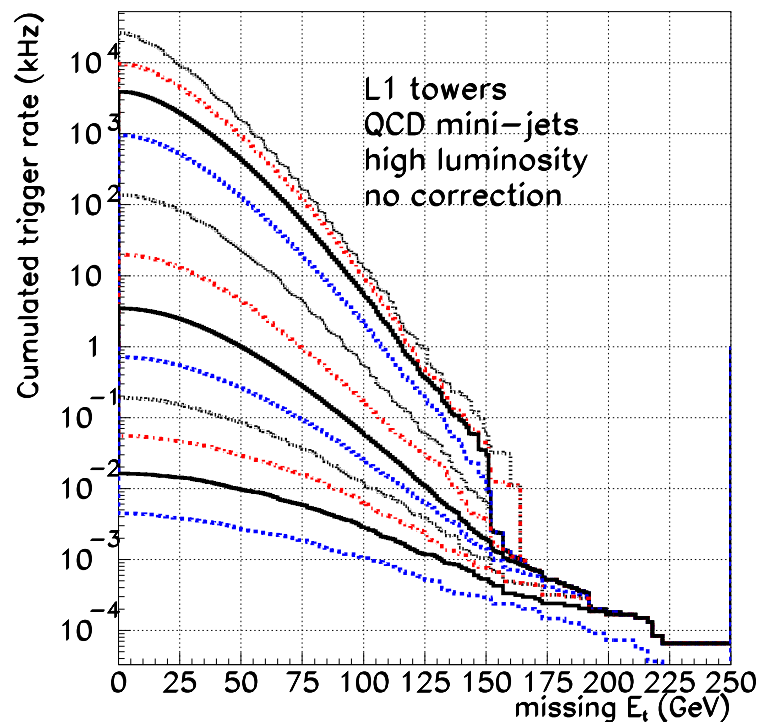
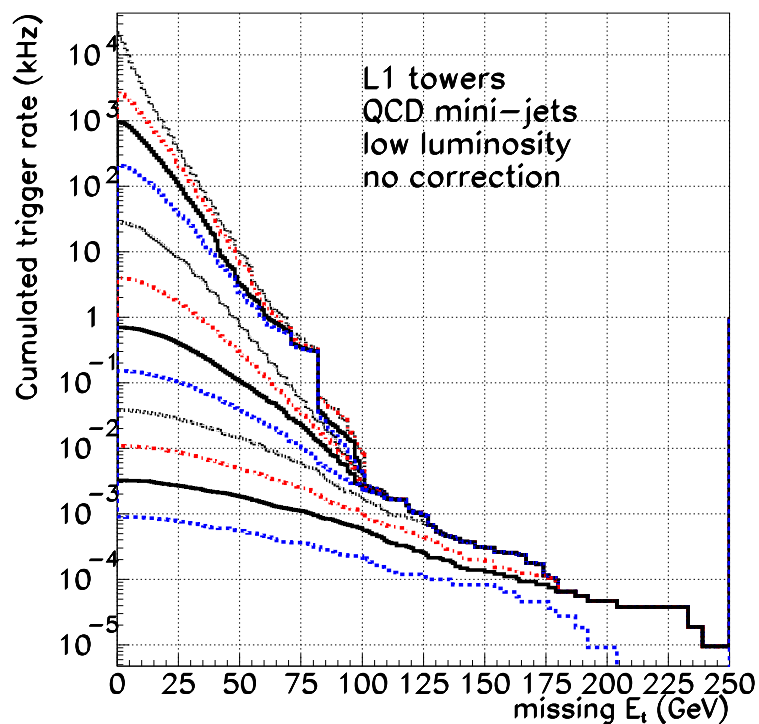
Low lumi rates

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1 Hz threshold –L1 ~ 125 GeV, L2 ~ 120 GeV

10 Hz threshold –L1 ~ 110 GeV, L2 ~ 105 GeV

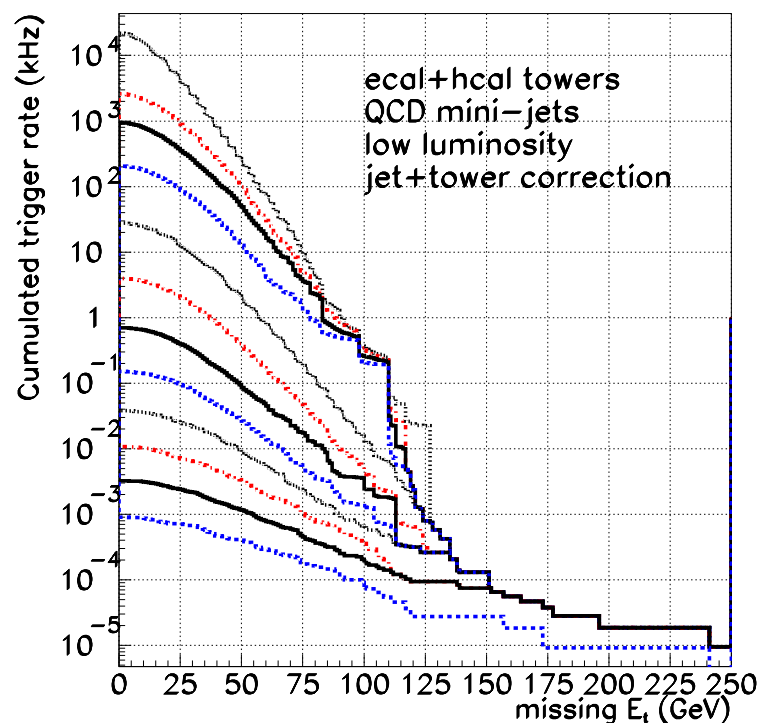
ledges : PAW multiplied some ntuples, fixed, rerunning





Corrected low lumi rate

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"type 2 correction" (Sasha)
calibrated jets ($E_t > 30$ GeV)
+out-of-cone towers

tower calib.: as if 30 GeV jets

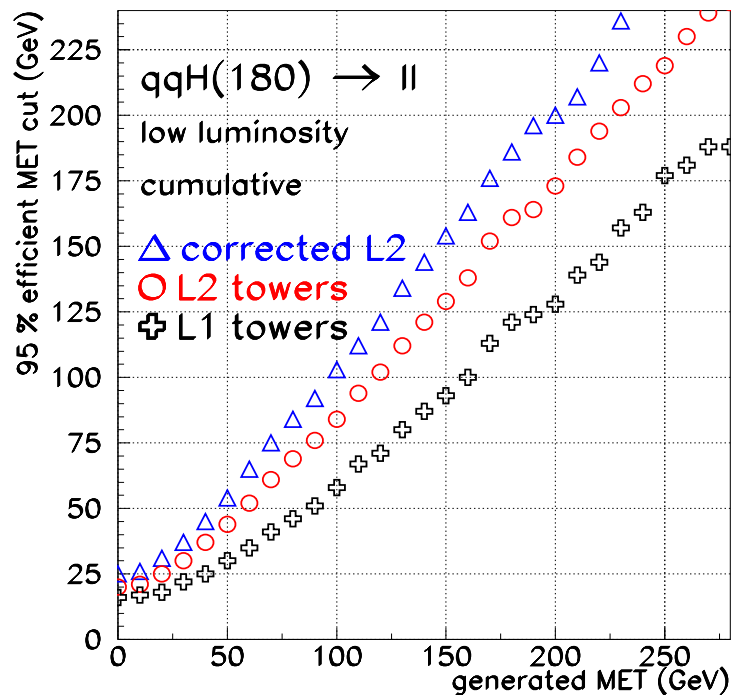
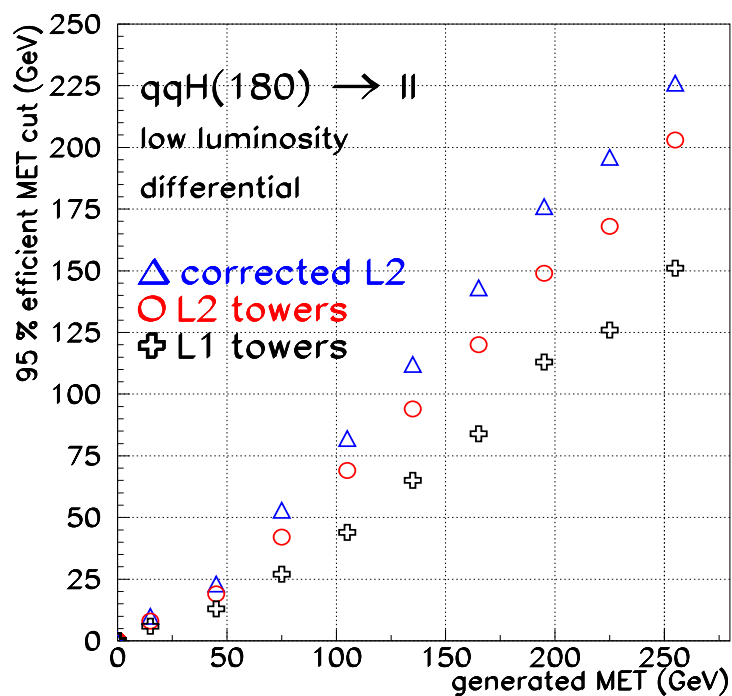
**statistics need is more apparent
here in almost every channel**



95% efficient cut

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After L2 correction the average MET is correct
but the MET resolution is not reduced
main source of MET resolution is energy measurement resolution
(not : nonlinearity, magnetic field)



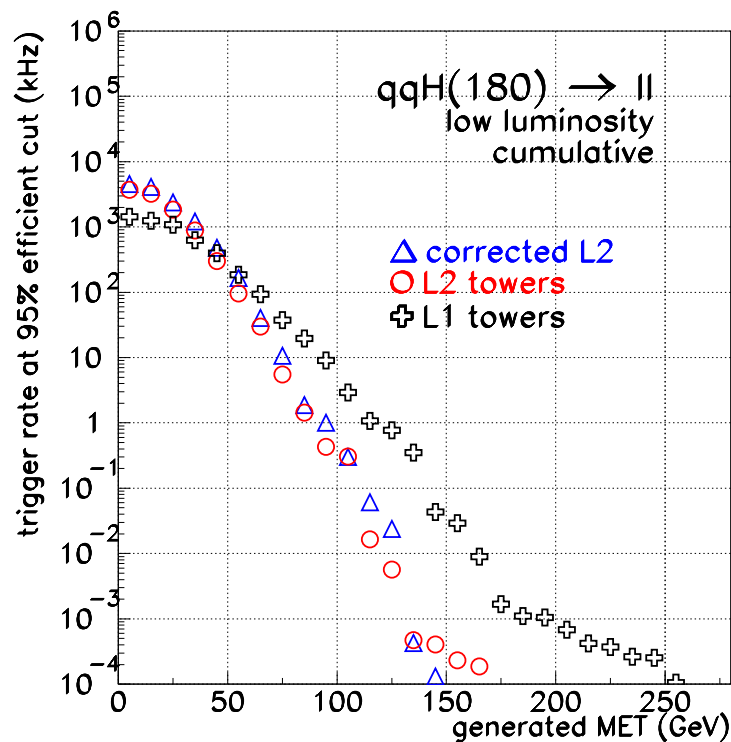
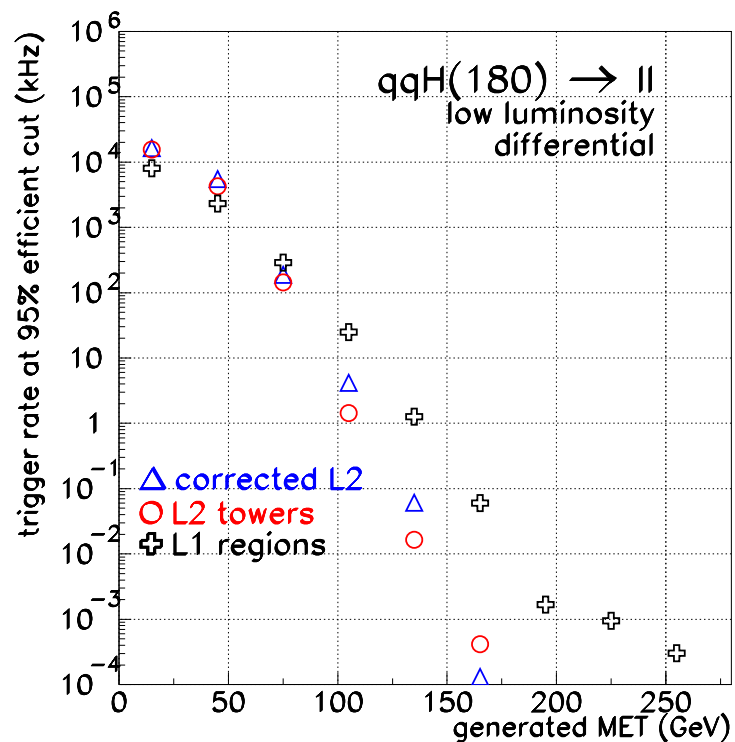


Rate at 95% efficient cut

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L2 performs much better than L1 for high MET

L2.2 performs like L2.0 because sigma of MET is not reduced





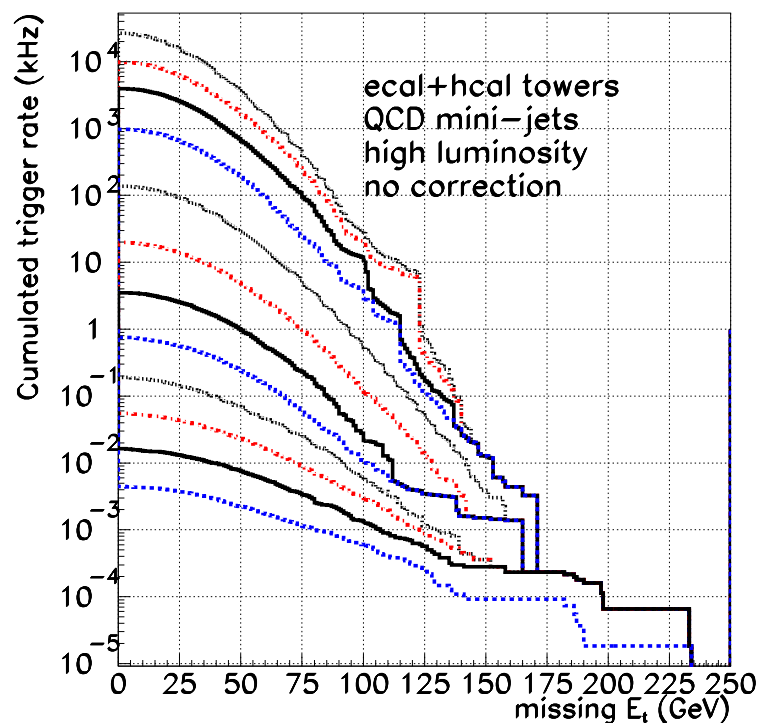
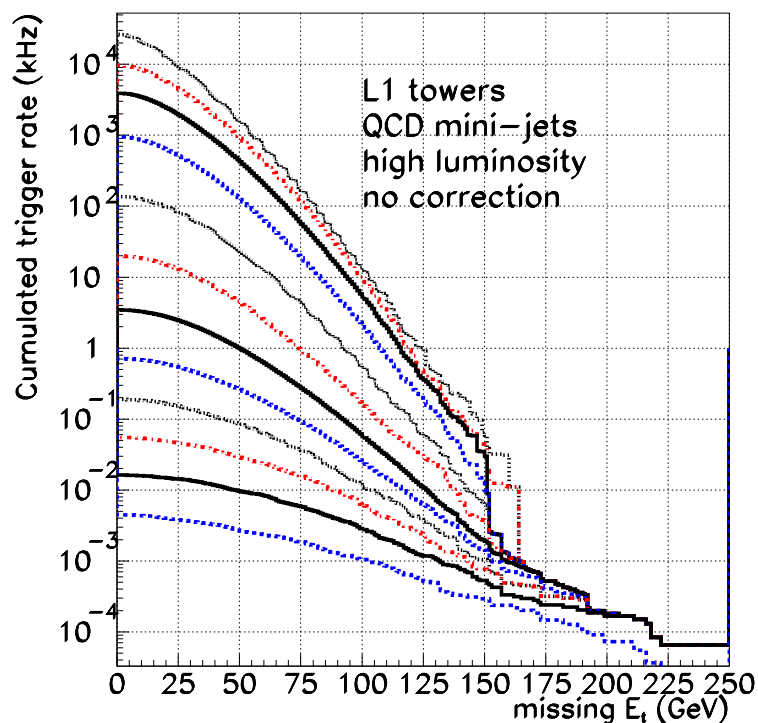
High lumi L1 & L2.0 rates

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1 Hz threshold – L1 ~ 175 GeV, L2 ~ 170 GeV

10 Hz threshold – L1 ~ 160 GeV, L2 ~ 160 GeV

The need for stats is endless in every p_t bin but we can interpolate
For L1 the PAW problem has been fixed, nice lines until the end of stats

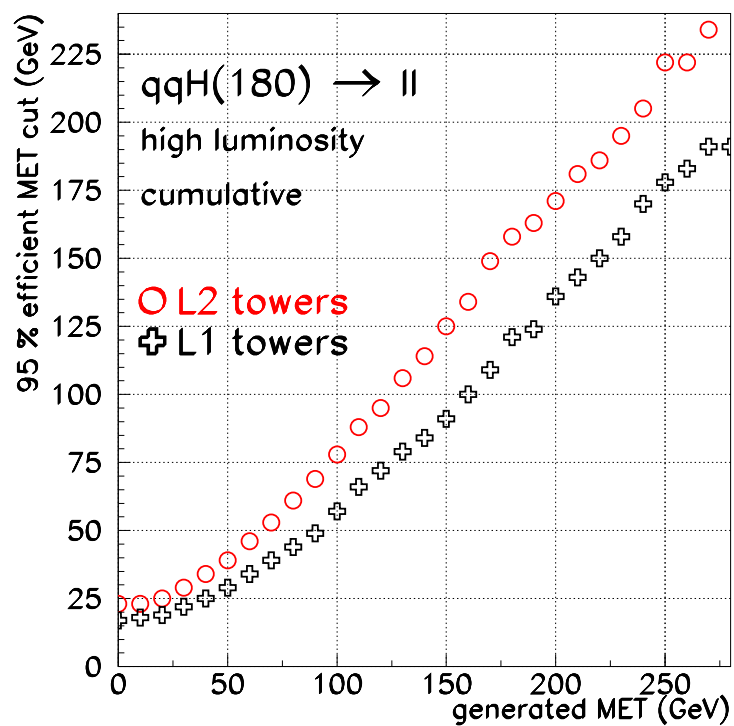
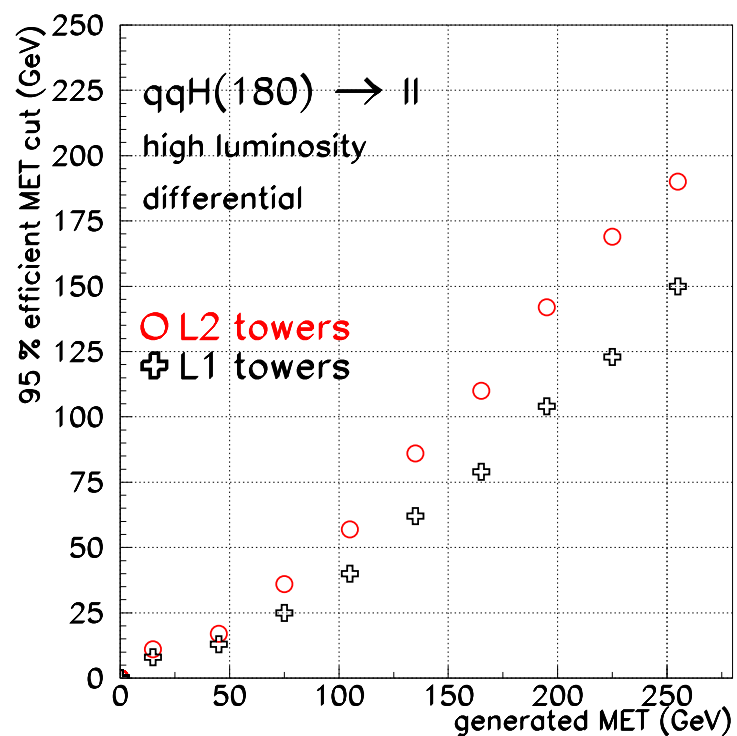




95% efficient cut

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L2 is more realistic then L1

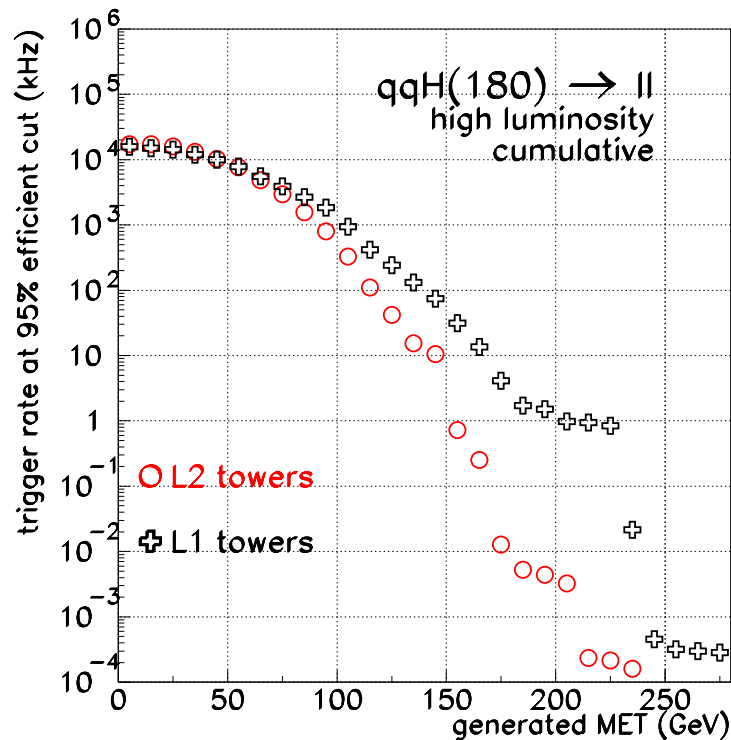
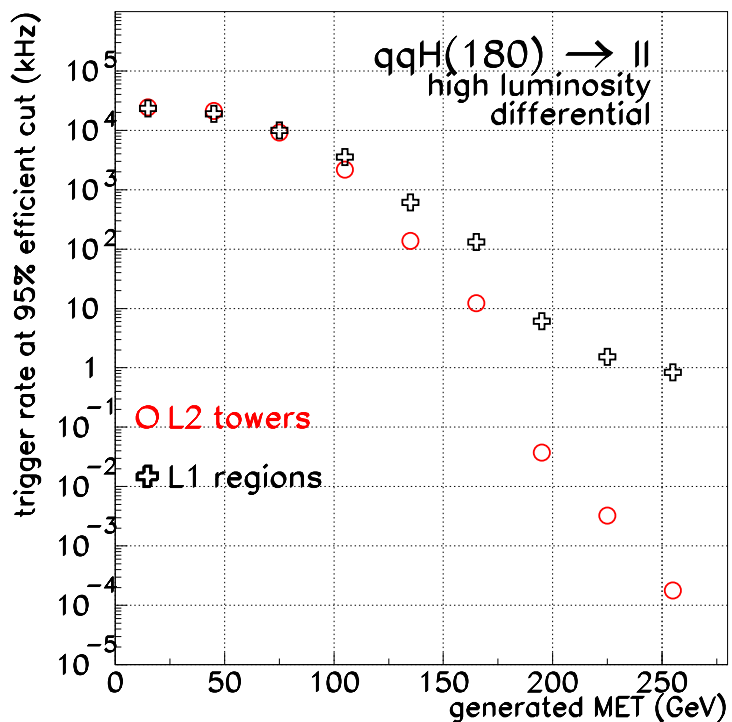




Rate at 95% efficient cut

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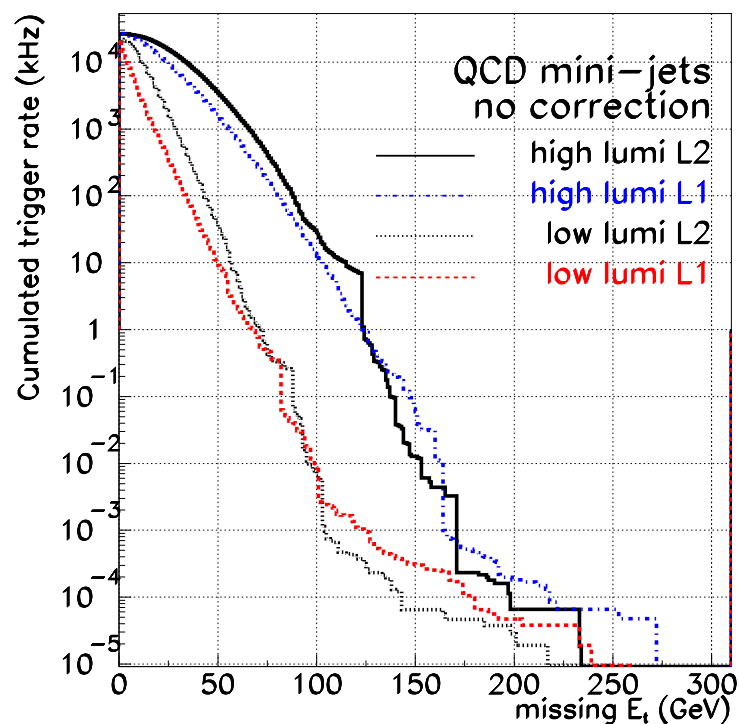
L2 performs better than L1 after all





Reconstructed Met rates

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Drop of all 4 rates

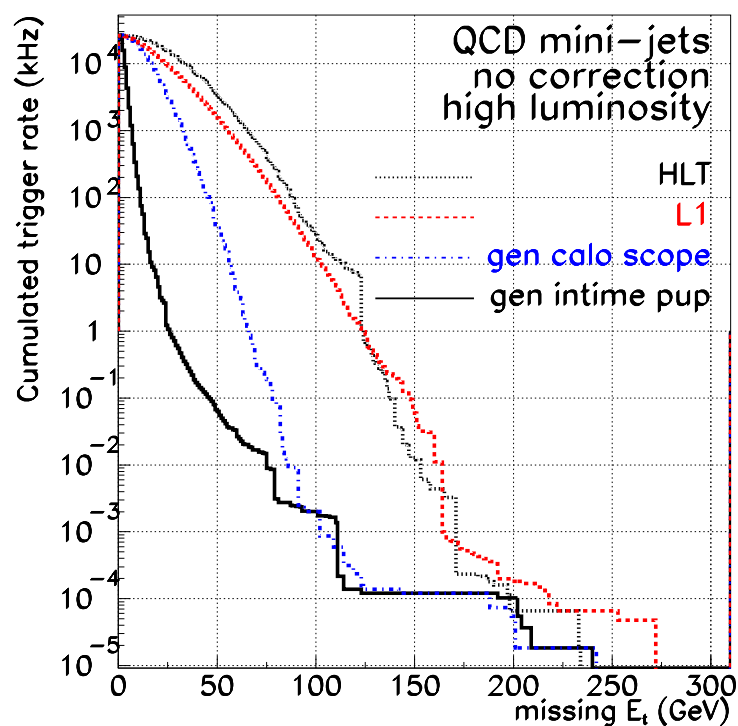
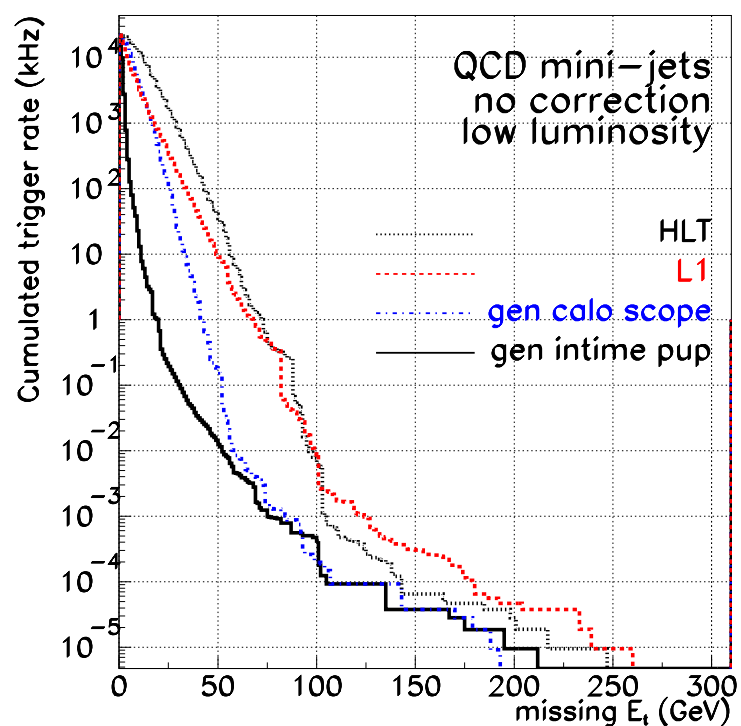
- missing stats
- L2 rate is more realistic
- L1 rate seems to orbit around L2
- L1 met scaled down
 - Higher threshold (LSB)
 - Max. jet Et (8–10 bits)
- L1 resolution is worse
- These two effects fight each other in the L1 rate



Summary of Met Rates (1)

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Main source of MET : resolution of the energy measurement



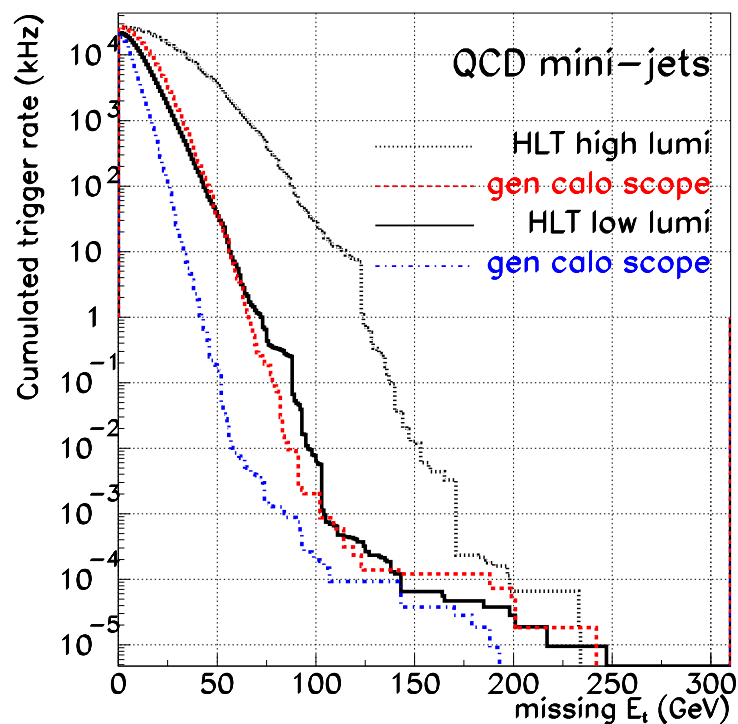
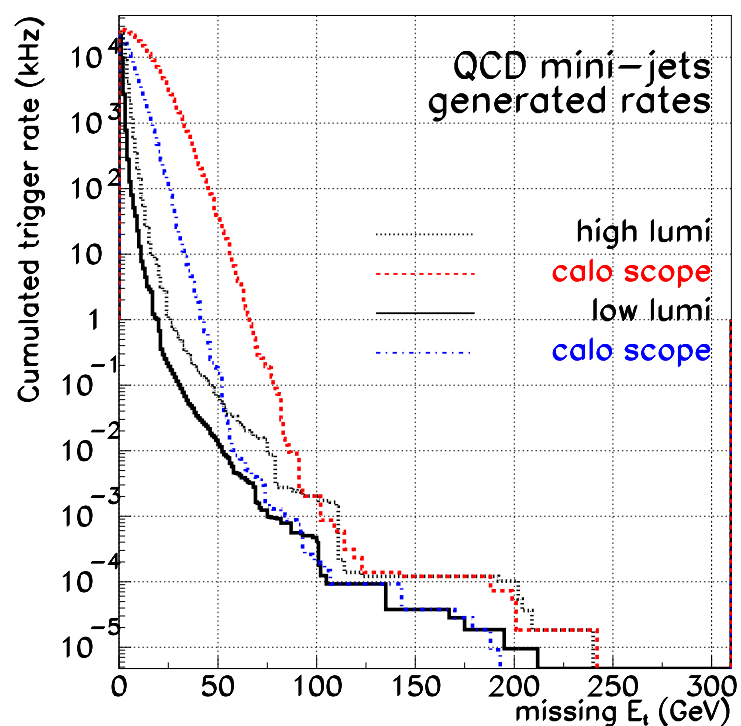


Summary of Met Rates (2)

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Pile-up has significant effect

$\langle \text{MET} \rangle \sim \langle \text{MET}_{\text{no pileup}} \rangle * \sqrt{\langle \text{pile-up} \rangle}$ for moderate p_{th}

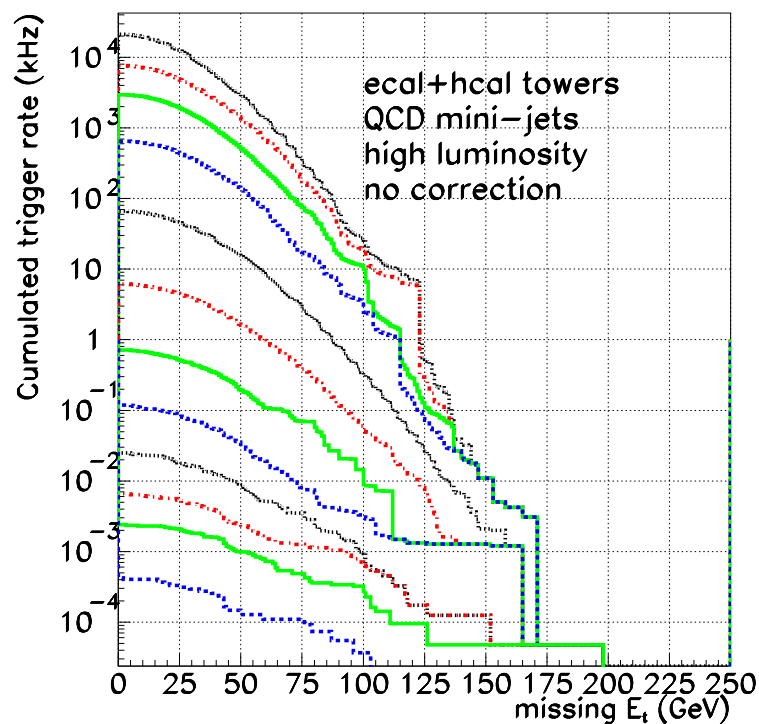
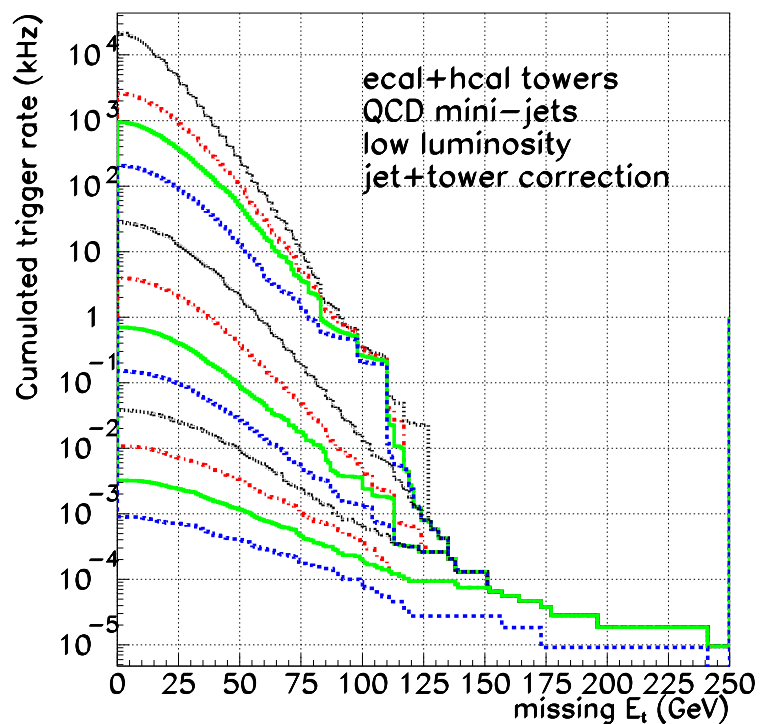




L2 Rates with 2 jet veto

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$d\Phi(\text{axes of 2 highest } E_t \text{ jets}) > 0.5$
better fights real missing E_t (c,b,t jets)





L2 2 jet veto summary

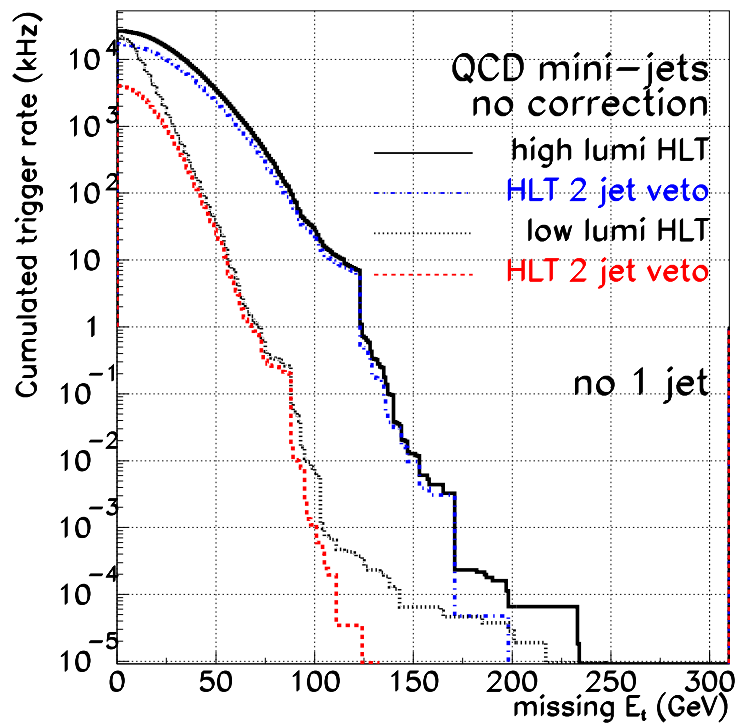
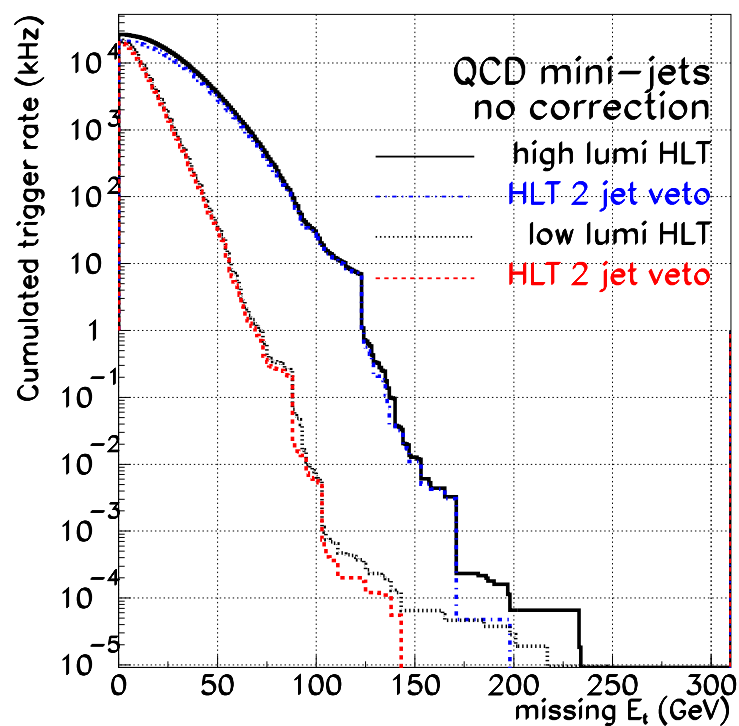
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Drop of all 4 rates – missing stats of 15–50 GeV

Significant difference – only below 1 Hz, offline analysis cut

LEFT : $d\Phi > 0.5$

RIGHT : $d\Phi > 1.0$ and no monojet events

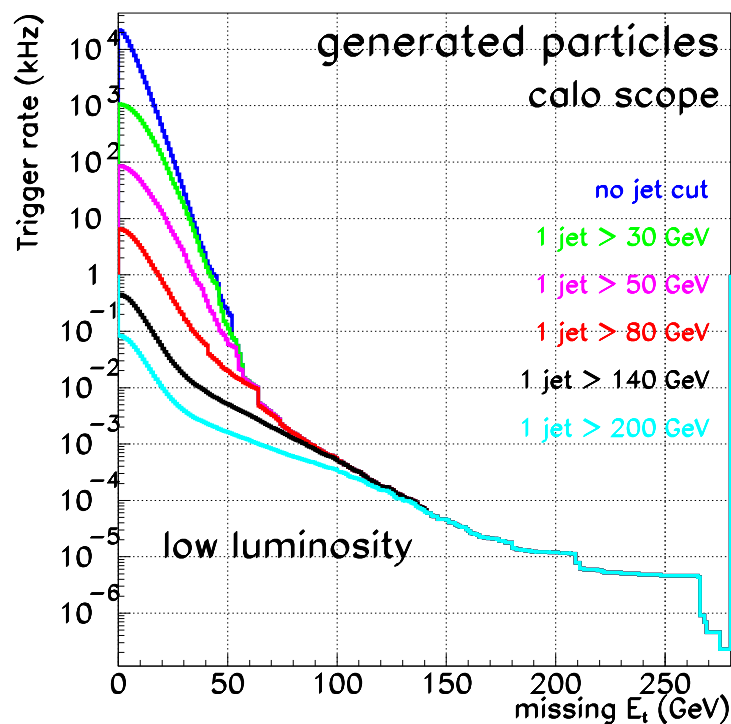
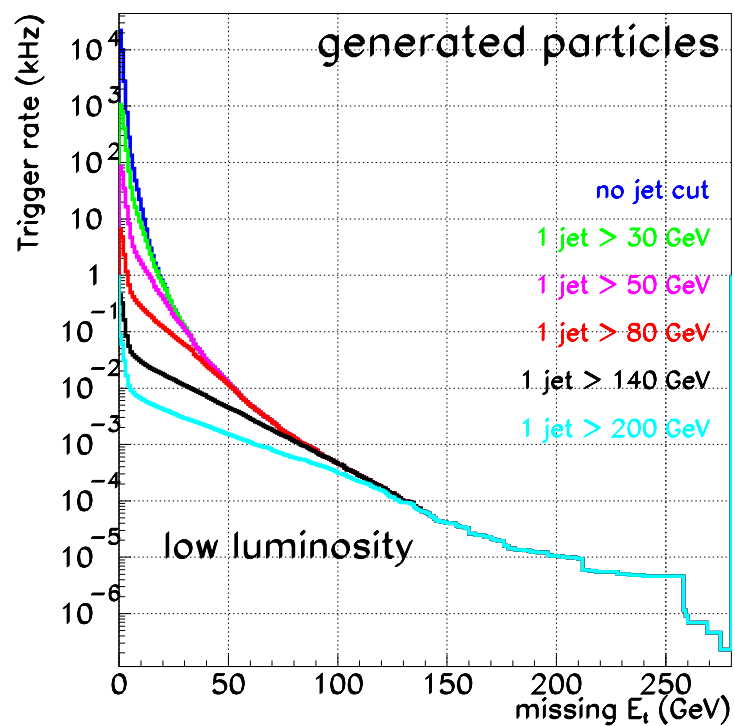




1j+met GEN low lumi rates

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Helps to reduce the low energy mess

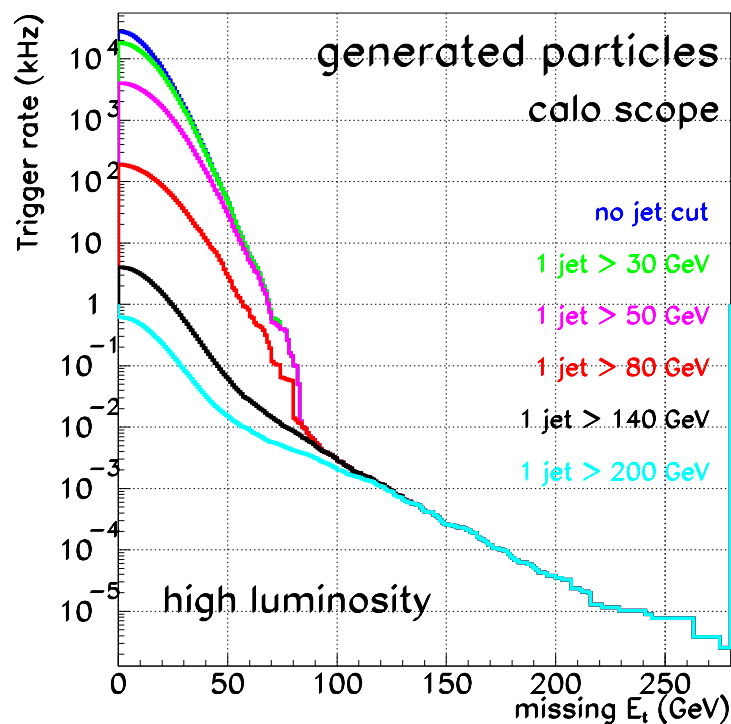
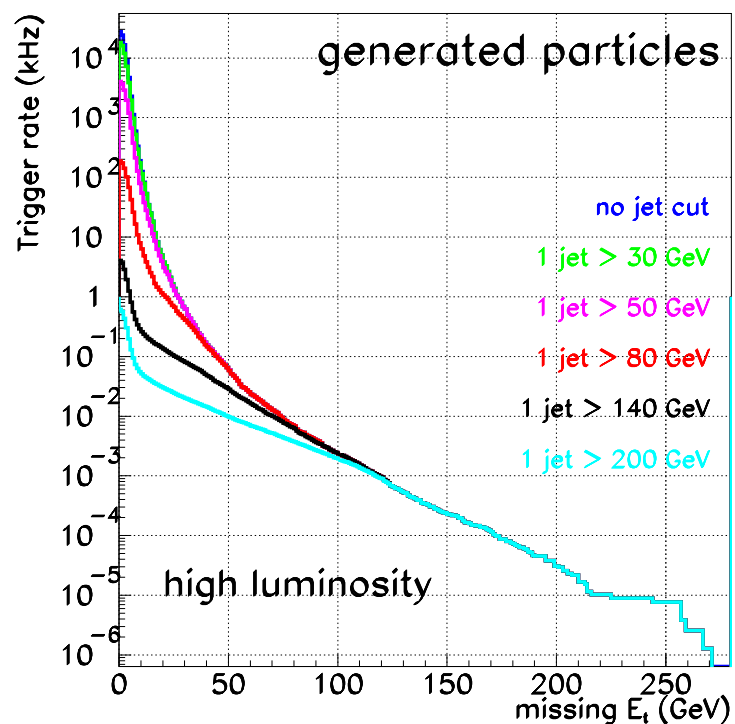




1j+met GEN high lumi rates

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Even better seen : helps to reduce the low energy mess

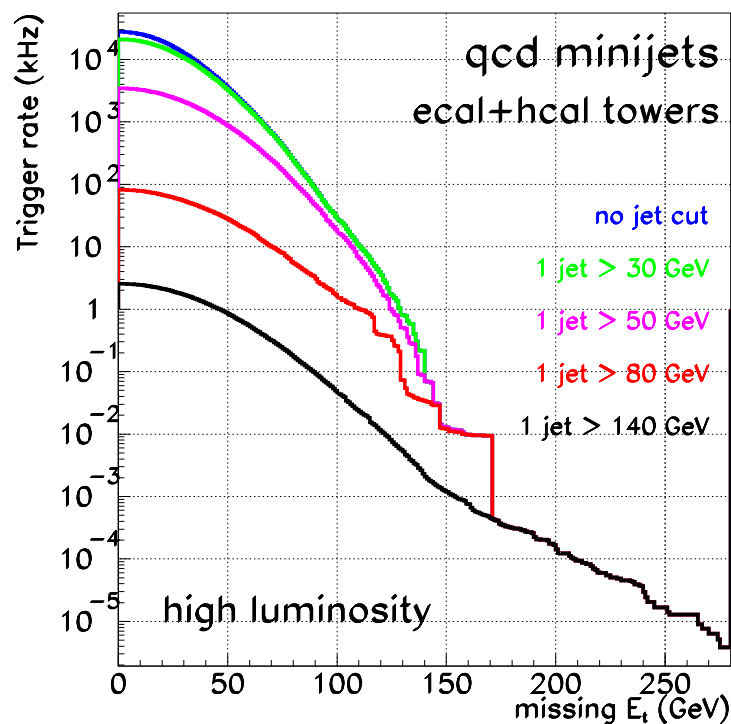
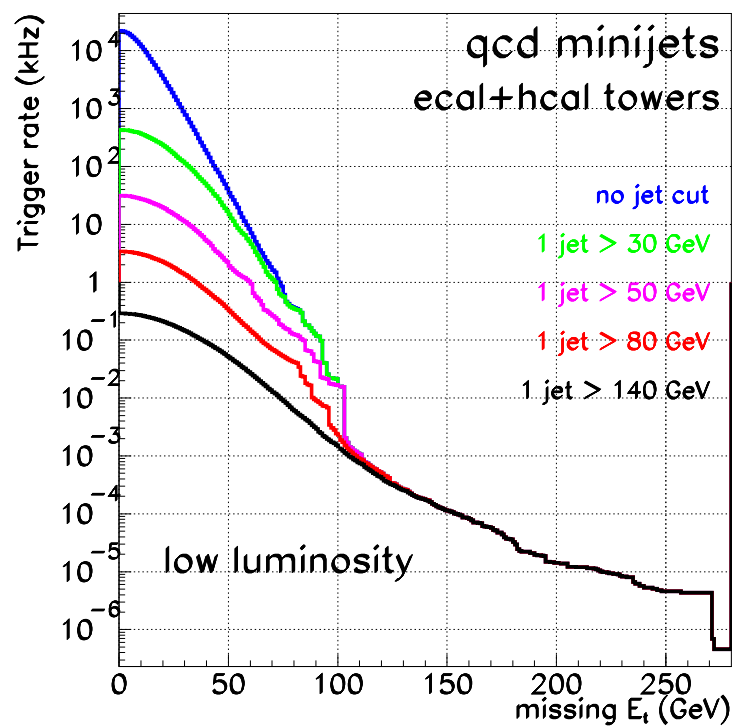




1 jet + met L2 rates

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More statistics is needed





Summary

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The HF (cmsim) bug is cured by Salavat's filter

- L2 performs better than L1 for MET > ~ 70 GeV
- L1 thresholds (10 Hz) –low lumi :110 GeV, high lumi :160 GeV
- L2 thresholds (1 Hz) –low lumi :120 GeV, high lumi :170 GeV

Statistics

- We need more